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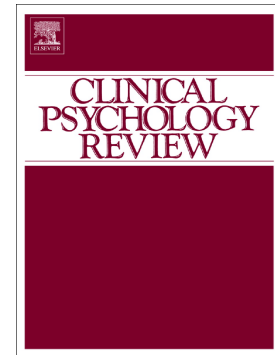
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Relationship between attachment style and symptom severity across the psychosis spectrum: A meta-analysis

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Abstract

There is growing evidence for the role of attachment in psychosis, however, to date there has been no quantitative review of the prevalence of insecure attachment in psychosis. The current study sought to systematically appraise studies investigating the prevalence of insecure attachment and the association with psychosis-spectrum experiences using meta-analytic techniques. A systematic search of studies carried out between January 1980 and 30th November 2015 found 25 papers eligible for inclusion. The meta-analysis showed that the prevalence of insecure attachment style was significantly higher in individuals with psychosis (76%) than in non-clinical samples (38%), with fearful attachment being the most prevalent. Across the continuum, there was a small but significant relationship between positive symptom severity and insecure attachment and a significant relationship between negative symptom severity and insecure attachment in the non-clinical analysis. This relationship was not found in the clinical group. The prevalence of insecure attachment appears to be high in psychosis, however, the relationship between symptom severity and attachment is small. Attachment theory may provide greater understanding of the development of positive symptoms than previously thought, however, research needs to include more at-risk samples and longitudinal research to fully understand the dynamics of this relationship.

Keywords: insecure attachment; psychosis; schizophrenia; meta-analysis

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Introduction

Adverse events in childhood, including trauma and neglect, have now been recognised as significant risk factors for a wide range mental health problems (Read & Bentall, 2012). Furthermore, there is increasing evidence of an association between early childhood trauma, in particular victimisation, and psychosis (Morrison, Frame & Larkin, 2003; Trotta, Murray, & Fisher, 2015) with a recent meta-analysis indicating that individuals with psychosis were at least twice as likely to have been exposed to childhood adversity as controls (Varese et al., 2012).

In response to this, theoretical models of psychosis have moved away from a strictly biological understanding of the disorder to an epigenetic one that describes how early trauma and neglect impact brain development through the stress regulation functions of the HPA axis (Read, Bentall & Fosse, 2009) and evidence from non-clinical samples suggest psychotic-like experiences, in particular paranoia, are common within the general population and exist on a continuum of normal experiences (Berry, Wearden, Barrowclough et al., 2006; Freeman et al., 2005). This move towards the conceptualisation of psychosis as a continuum disorder, at least in part driven by early interpersonal experiences, has led researchers to theorise about the role that attachment may have in the development and treatment of psychosis (Read & Gumley, 2008). Attachment style has been seen as both a potential risk and protective factor in psychosis (Harder, 2014) and the implications for recovery from psychosis have also been discussed in terms of engagement and treatment development (Barker, Gumley, Schwannauer & Lawrie, 2015; Read & Gumley, 2008).

Attachment theory proposes that one's interpersonal relating style and ability to regulate emotions develop as a result of early experiences with primary care-givers (Bowlby, 1969, 1984; 1988). The attachment system is a safety-seeking mechanism

designed to be activated by environmental threats (Bowlby, 1969). When an infant has an experience of a primary care-giver who is responsive, available and sensitive to their needs they develop 'secure attachment'. This primary relating experience allows the infant to develop internal working models of representations of the self and others which serve as the foundation for future relationships. In adulthood, secure attachment is expressed through autonomy, an ability to reflect on and manage one's cognitive and emotional experiences, and valuing close relationships. However, when a care-giver is absent or not able to provide a safe space from which the infant can explore the world and learn, an insecure attachment style can develop.

There are three main types of insecure attachment in adulthood; anxious (also referred to as anxious-ambivalent or preoccupied), avoidant (also referred to as dismissing) and fearful (Ainsworth & Bell, 1970; Bartholomew & Horowitz, 1991; Main & Solomon, 1986; 1990). An anxious attachment style is thought to develop as a result of inconsistent availability of the primary care-giver, leading the infant to learn to exaggerate emotional expression and minimise exploration of the environment their to keep the attention of the care-giver. In adulthood this is represented by heightened emotional expression and a reduced sense of autonomy leading to increased dependence on others. Avoidant attachment style, characterised in adulthood by over-regulating emotions and avoiding experiences of close relationships, develops from experiences of rejection from care-givers, in particular when expressing distress. Fearful attachment, often described as disorganised in childhood, is thought to arise in adaptation from either disrupted care experiences, such as neglect and early losses, or from frightening or frightened care-giver behaviour, including physical and sexual abuse in childhood. These experiences lead the child to respond to their caregiver with fear or contradictory behaviours, such as approach-avoidance or freezing when

distressed and seeking comfort (Main & Solomon, 1986; 1990). In adulthood, fearful attachment is represented by an inconsistent sense of self and an inability regulate one's emotions. People who present with a fearful attachment style often present as both highly anxious and avoidant due to a conflicting desire for and resistance to emotional closeness (Bartholomoew & Horowitz, 1991).

Disruptions in care, such as early adversity and trauma, not only influence the way we relate to others in adulthood but also change the neuroendocrine stress regulation functions of the brain (Barker et al., 2015; Read et al., 2009). Individuals with disrupted attachment release higher levels of stress hormones, such as cortisol, when their attachment system is activated, for example through separation from a significant other in adulthood (Mikulincer & Shaver, 2007). This framework of affect regulation could help explain the development of psychosis through the increased stress-vulnerability and maladaptive coping strategies as a result of early adversity, which in turn influences the onset and expression of symptoms and subsequent recovery (Barker et al., 2015).

To date there have been three narrative reviews examining the relationship between attachment and psychosis. Two of these reviews have provided an overview of the role of attachment in the development of, and recovery from, psychosis (Berry, Barrowclough & Wearden, 2007b; Korver-Nieberg, Berry, Meijer & de Haan, 2014) while the third provided a comprehensive review of the evidence base for the construct validity of attachment assessment in psychosis (Gumley, Taylor, Schwannauer & MacBeth, 2014). All three reviews concluded that attachment is associated with poorer outcomes in psychosis. In particular, insecure attachment has been found to be associated with an earlier onset of illness, poorer therapeutic alliance and engagement with mental health services, less adaptive recovery styles and poorer quality of life

(Berry et al., 2007b; Korver-Nieberg et al., 2014; Gumley et al., 2014). Individuals with avoidant attachment styles also tended to have longer durations of hospitalisation compared to those with secure attachment styles (Ponizovsky, Nechamkin & Rosca, 2007).

While the impact of insecure attachment has been discussed in the literature in relation to assessment, therapeutic engagement and recovery, there has been less research focused specifically on the prevalence of attachment disruption in psychosis and the evidence of associations with psychosis symptoms is inconsistent. Higher rates of avoidant attachment style have been reported in psychosis populations compared to non-clinical controls (Berry et al., 2007b; Korver-Nieberg et al. 2014), however, this conclusion was drawn from a small number of studies. What is more, the majority of these studies assessed attachment style through the Adult Attachment Interview (AAI: Main, Kaplan, & Cassidy, 1985) which has been found to have poor validity within psychosis samples (Berry et al., 2007b). This has been addressed in more recent studies by the development and adoption by most researchers of the Psychosis Attachment Measure (PAM: Berry, Wearden, Barrowclough, & Liversidge, 2006), a measure specifically developed to assess attachment in people with psychosis, enabling higher consistency in measurement across studies.

A modest association between avoidant attachment style and positive and negative symptomatology has been found in clinical populations (Korver-Nieberg et al., 2013; Gumley et al., 2014), but the evidence for an association between symptom severity and anxious attachment style is more equivocal, and possibly confined to subclinical populations (Korver-Nieberg et al., 2014). Variability in findings could be due to inconsistencies in attachment assessment, small sample sizes and a limited number of studies. Existing reviews also highlighted the limitations of cross-sectional

studies and small number of study samples drawn from early onset or 'at-risk' populations when drawing conclusions about the relationship between attachment and psychosis (Korver-Nieberg et al., 2014; Gumley et al., 2014).

While existing reviews have provided a comprehensive summary of the literature in relation to measurement and treatment outcomes, to date there has not been a systematic quantitative review of prevalence of attachment styles in psychosis and relationship to symptoms. The current paper aims to use meta-analytic techniques to present a quantitative review of the prevalence of reported attachment styles within psychosis populations and critically appraise the evidence for an association between insecure attachment styles and symptom severity in across the psychosis continuum. Specifically, the following questions were asked:

1. What is the prevalence of insecure attachment in people with psychosis and how does this compare to prevalence in non-clinical samples?
2. More specifically, what is the prevalence of different insecure attachment styles amongst people with psychosis?
3. Is insecure attachment associated with increased psychosis-spectrum experiences within both clinical and non-clinical samples?

Method

Inclusion criteria

Studies were included in the analysis if they (i) used a validated measure of attachment style (ii) used a validated measure of psychosis or psychotic-like symptoms (iii) used quantitative or mixed methodology (iv) were published in a peer-reviewed journal (v) were published between January 1980 and 30th of November 2015 (vi) were written in English. Studies were included in the analysis if they employed one of the following methodologies: (i) prospective cohort studies (ii) cross-sectional studies

which reported associations between psychosis symptoms and attachment styles (iii) case control studies, which reported associations between psychosis symptoms and attachment styles regardless of whether this was the primary outcome of the paper.

Exclusion criteria

Studies were excluded if they were (i) conference extracts or poster presentations (ii) book chapters (iii) theoretical or review articles (iv) unpublished studies (v) solely presented qualitative data (vi) single case studies or dissertations (vii) did not include a measure of attachment or (viii) psychosis symptomatology. As in a previous review (Korver-Nieberg et al. 2014) studies reporting parental bonding or other attachment-related concepts, such as relating styles, were excluded as they do not directly assess attachment style. Studies were also excluded if insufficient statistical information was reported in the paper to be included in the comparison, for example where only significant findings were presented or when authors contacted did not provide further statistical information.

Literature search

Relevant studies were identified through a systematic search of the databases Medline, PsycINFO and Web of Science. The following search terms were used as keyword or heading searches: (ATTACHMENT or ADULT ATTACHMENT) in combination with psychosis related terms: (PSYCHOSIS or PSYCHOTIC or SCHIZOPHRENIA or SCHIZOTYPY). Hand searches were carried out in relevant journals and reference lists and search results were cross referenced with existing reviews (Berry et al. 2007b, Gumley et al. 2014, Korver-Nieberg et al., 2014) for any additional studies which may have been missed.

The current review followed the flow of information as suggested by the PRISMA statement (Moher, Liberati, Tetzlaff, Altman & the PRISMA group, 2009). Duplicate

records were removed after the initial search and the above inclusion and exclusion criteria were applied (see Fig. 1).

Quality assessment

Studies were quality assessed using the Standard Quality Assessment Criteria for Evaluating Primary Research Papers (Kmet, Lee & Cook, 2004). A quality assessment tool which allows for a range of quantitative study methodologies to be compared and has been found to have good inter-rater reliability (Kmet, Lee & Cook, 2004). All papers were quality assessed by SC and a sample of 10 were also independently rated by a second assessor. High levels of agreement were found (90%) between the reviewers.

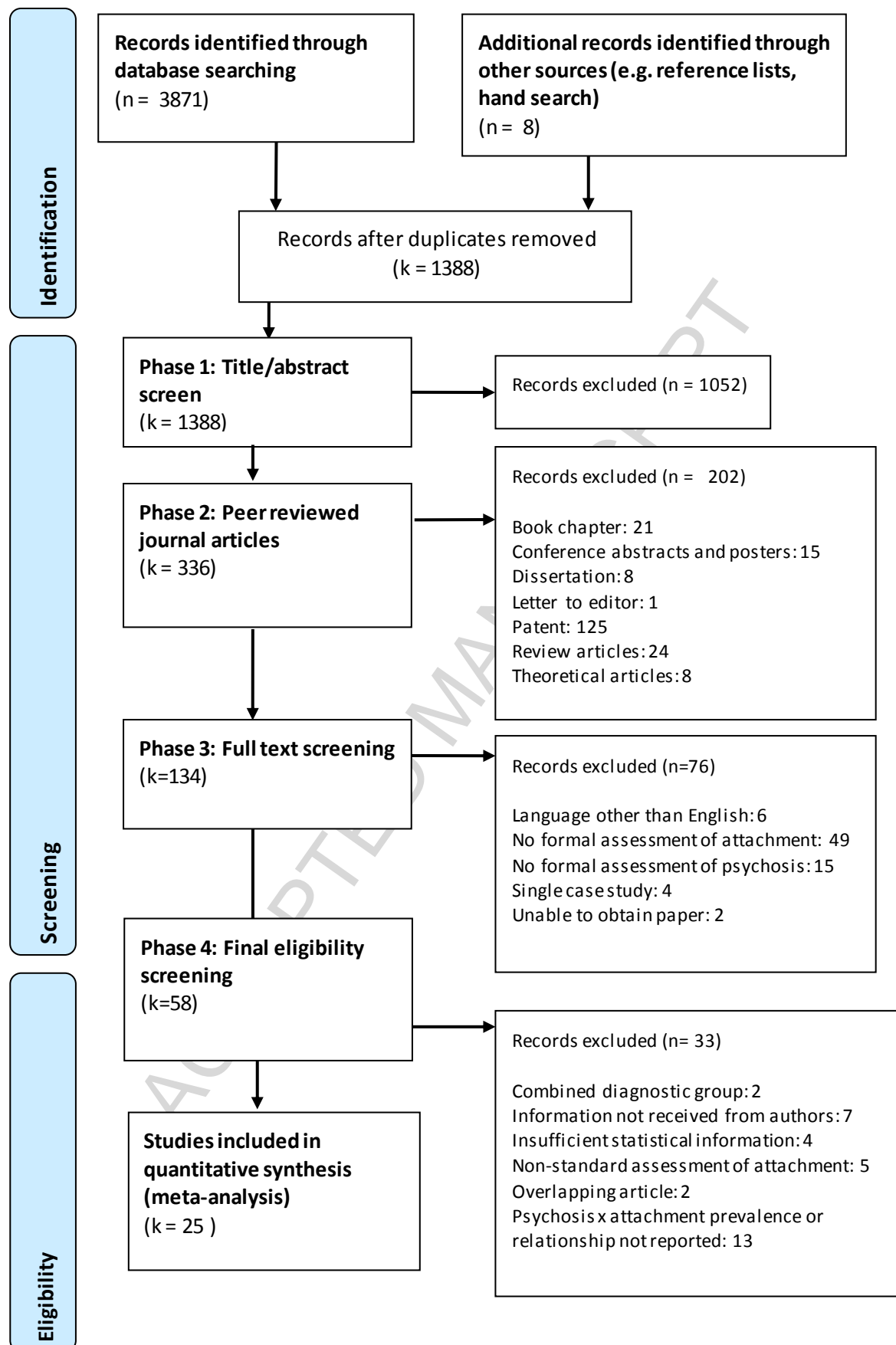


Fig. 1. Flow diagram of systematic search (Moher et al., 2009)

Studies meeting inclusion criteria

Based on the inclusion criteria, 27 studies were eligible for inclusion in the final meta-analyses. Of those identified, two papers presented data on the same study (Huguelet et al., 2015; Rieben, Huguelet, Lopes, Mohr & Brandt, 2014). Once reviewed, the most appropriate article was selected based on the relevance of statistical data reported to the current analysis (Huguelet et al., 2015). A second paper was excluded (Korver-Nieberg, Berry, Meijer, Haan & Ponizovsky, 2015) because the majority of the data reported was from samples which were already presented in papers included in the analysis.

Analytic procedure

Multiple meta-analyses were conducted as part of the current review using Comprehensive Meta Analysis version 3.3 (Borenstein, Hedges, Higgins & Rothstein, 2014). The first meta-analysis was a quantitative synthesis of prevalence rates of insecure attachment styles within clinical and non-clinical populations. Subsequent analyses were carried out on each of the insecure attachment styles reported in the included studies. The second set of analyses focused on the relationship between attachment style and symptom severity in clinical and non-clinical study samples.

Heterogeneity of effect sizes

For all analyses, heterogeneity statistics (Q test and I^2) were carried out to examine the amount of variance across the studies. Cochran's Q statistic assesses for heterogeneity due to sampling error, however it has been found to have poor power to detect true heterogeneity when analyses only include a small number of studies. Therefore, the I^2 statistic, which calculates the amount of variance in effect size accounted for by between-study variance was also examined (Higgins & Thompson, 2002). As it is not possible to assume that all studies in the meta-analyses share a

common effect size due to the heterogeneous samples reported on, a random effects model was adopted a priori for all meta-analyses (Borenstein, Hedges & Rothstein, 2007). One study removed analysis was also carried out within the subgroup analysis of symptom severity and attachment style to examine whether any specific sample had increased impact on the pooled effect size (Ryan, 2013).

Publication bias

Publication and other biases introduced through search terms, inclusion and exclusion criteria can influence the findings when conducting a meta-analysis. Publication bias was assessed for using Egger's test for funnel plot asymmetry (Egger, Davey-Smith, Schneider & Minder, 1992). Duval and Tweedie's trim-and-fill analysis (Duval & Tweedie, 2000) was then used to estimate the number of missing studies based on any asymmetry indicated in a funnel plot of the standard error of each study. This was then used to present adjusted effect sizes and confidence intervals, which adjust for any potential missing studies. However, it is important to note that this method assumes homogeneity of effect sizes and therefore should be interpreted with caution when there is high heterogeneity of effect sizes.

Effect size computation

Whilst meta-analysis techniques have traditionally been applied to effect size data, it is possible to apply the method to cumulative proportions and rates by treating the incident rate as the effect size (Borenstein, Hedges, Higgins & Rothstein, 2009).

All studies included in the analysis which reported a relationship between symptom severity and attachment style provided Pearson's r correlation coefficients which can be treated as the effect size. A number of studies included data from one or more subscales of positive and negative symptoms rather than a composite score (e.g.

GPTS, LSHS). In these instances, the subscale data were categorised as either positive or negative symptoms for the purposes of the analysis. To control for variance being influenced by the correlation coefficient, all data were transformed using Fisher's z scale and analysis was carried out on the transformed data before being converted back to r (Borenstein et al., 2009).

Independence of effect size

As stated above, a number of studies reported correlations from multiple symptom subscales, such as hallucinations and delusions rather than a composite score of positive or negative symptoms. Reporting multiple effect sizes from the same study would violate the assumption of independence needed to carry out a meta-analysis. In these instances, an average correlation was calculated. When averaging correlations, it is necessary to control for potential bias by converting Pearson's r to Fisher's z before averaging the transformed correlations and then converting back to Pearson's r to be included in the analysis (Corey, Dunlap & Burke, 1998). In studies where multiple measures of attachment or psychotic experiences were used the measure used for the current analysis is indicated in Table 1.

Results

Characteristics of studies

Twenty-five papers based on 37 samples were included in the analysis. An overview of the characteristics of studies is shown in Table 1. Demographic information as reported in the primary studies is shown for all participants. Based on the data available within published reports, there were 11,696 unique participants (clinical: $n = 1305$; non-clinical: $n = 10,391$), 61% were female. The reported mean age ranged from 15.7-52.0 years with a composite participant mean age of 30.42 years ($SD = 10.59$), however, information about age and gender was not available from three large studies

(MacBeth et al., 2011; Sitko, Bentall, Shevlin, & Sellwood, 2014). About half of the studies were based in the UK ($k = 12$) and included clinical samples from community mental health services ($k = 11$). Seven studies included clinical participants who were identified as ultra-high risk or experiencing psychosis for the first time and two studies included inpatient samples. Non-clinical samples were primarily made up of healthy adult volunteers ($k = 10$) and a small number were exclusively drawn from student populations ($k = 4$). The majority of studies were cross-sectional design ($k = 17$) while the remainder were case-control ($k = 10$).

Measures of attachment style

Six different measures of attachment were used within the included 25 studies, details of which are displayed in Table 1. The most commonly used were the Psychosis Attachment Scale (PAM; Berry, et al., 2006; $k = 9$) and the Relationships Questionnaire (RQ; Bartholomew & Horowitz, 1991; $k = 8$). The PAM is a 16-item self-report scale derived from existing attachment measures (Bartholomew & Horowitz, 1991; Brennan, Clark & Shaver., 1998) for use specifically within psychosis populations to assess the dimensions of anxious and avoidant attachment in relation to non-romantic relationships. Respondents rate four statements which describe their current experience of relationships with significant people in their life. Scores are calculated for the two attachment dimensions, anxious and avoidant, and respondents are ascribed the attachment style on which they received the highest score. This was the most commonly used measure in studies investigating the relationship between symptom severity and attachment style ($k = 8$) followed by the RQ ($k = 5$). The RQ (Bartholomew & Horowitz, 1991) is a brief self-report questionnaire adapted from the Adult Attachment Questionnaire (Hazan & Shaver, 1987) based on four brief descriptions of experiences of relationships. It categorises adult attachment into four attachment

styles; secure, fearful/avoidant, preoccupied (anxious) and dismissing/avoiding.

Respondents rate how much each of the statements relates to them as well as selecting the one which they feel most appropriately describes their relationship style. When investigating prevalence, the RQ was most commonly used ($k = 4$). A full review of attachment measures used within psychosis research has been carried as part of the most recent review in this field (Gumley et al., 2014).

Measures of psychotic experiences

Assessment measures for psychosis symptoms and psychotic experiences differed between clinical and non-clinical studies. In studies with clinical samples, ten measures of symptom severity were used (see Table 1) the most common of which was the Positive and Negative Syndrome Scale (PANSS; Kay, Fiszbein & Opler, 1987; $k = 13$) an observer rated assessment of positive, negative symptoms of psychosis and general psychopathology. All but one of the clinical studies (Strand, Goulding, & Tidefors, 2015) utilised observer rated assessments of global psychosis symptoms, however, two of the case-control studies (Korver-Nieberg et al., 2013; van Dam, Korver-Nieberg, Velthorst, Meijer, & de Haan, 2014) also included self-report assessments of psychosis. In the six studies included which assessed psychosis symptoms in non-clinical samples, ten measures of psychosis symptoms and schizotypy were used. The most common being the revised Launay-Slade Hallucination Scale (rLSHS; Morrison, Wells & Nothard, 2000; $k = 3$) a self-report measure of hallucinatory experiences in non-clinical populations. Only one non-clinical study (Sitko et al., 2014) carried out a clinical interview with participants while the remainder used a combination of self-report questionnaires to assess positive and negative symptom experiences.

Table 1. Summary of studies included in meta-analysis

Source (Author, date, country)	Mean age (S.D.)	Gender (% male)	Psychosis measure	Attachment measure	N	Participants	Prevalence of subtypes of insecure attachment reported?			Associations with symptoms reported?		Quality rating
							Anxious	Avoidant	Fearful	Positive	Negative	
Clinical studies												
Berry et al. (2008) UK	44.0 (12.8)	69%	PANSS	PAM	96	Community clinical sample				✓	✓	95%
Berry et al. (2012) UK	39.1 (11.3)	81%	PANSS PSYRATS ¹	PAM	73	Inpatient and community sample				✓		95%
Kvrgic et al. (2011) Switzerland	44.6 (11.53)	66%	PANSS	PAM	127	Community clinical sample				✓	✓	95%
Quijada et al. (2012) Spain	15.7 (3.1)	74%	PANSS	RQ	31	ARMS clinical sample	✓	✓	✓	✓	✓	87.5%
Gajwani et al. (2013) UK	19.0 (3.09)	65%	SIPS	RAAS	51	UHR clinical sample	✓	✓	✓			95%
Boyette et al. (2014) Netherlands	32.5 (8.48)	84%	PANSS	PAM	110	Community clinical sample				✓	✓	91%
Ponizovsky et al. (2014) Israel	37.5 (11.7)	90%	PANSS	RQ	101	Inpatient clinical sample	✓	✓	✓	✓	✓	91%
Strand et al. (2015) Sweden *	43.0 (12.54)	64%	SCL-90	RQ	47	Community clinical sample				✓		73%
Quijada et al. (2015) Spain	16.7 (5.9)	76%	PANSS	RQ	38	ARMS clinical sample	✓	✓	✓			87.5%
Case-control studies												
Couture et al. (2007) USA * ** - Paquette et al. (2001)	23.7 (nr) 30.2 (nr)	66% 50%	BPRS	ASQ	96 353	FEP clinical sample Healthy volunteers	✓	✓	✓			86%
Ponizovsky et al. (2007) Israel	38.4 (10.2)	100%	PANSS	AAQ	30	Community clinical sample	✓	✓				77%
	34.4 (10.0)	100%			30	Healthy volunteers						

Study	Sample size (n)	% of sample	Scale	Comparison group	n	Description	1	2	3	4	Overall %
Korver-Nieberg et al. (2013) UK *	17.1 (nr)	59%	PANSS GPTS ¹	PAM	32	Adolescents with early psychosis				✓	95%
	16.3 (nr)	64%	CAPE		78	Healthy volunteers					
Michail & Birchwood (2014) UK	24 (4.5)	77%	PANSS	RAAS	60	FEP (no social anxiety)					
	24.4 (5.1)	35%			20	FEP (with social anxiety)	✓	✓	✓		91%
	27.6 (5)	35%			31	Social anxiety controls					
	24.2 (5)	46%			24	Healthy volunteers					
Ringer et al. (2014) USA	46.6 (9.15)	100%	PANSS	ECR	52	Community clinical sample					
	52 (11.25)	100%			26	Men with diagnosis of HIV/AIDS				✓ ✓	91%
van Dam et al. (2014) Netherlands	31.9 (10.58)	84%	SAPS ¹ SANS ¹	PAM	131	Community clinical sample					
	30.9 (8.12)	47%	CAPE ¹		123	Clinical sample siblings				✓ ✓	100%
	30.9 (7.47)	64%			72	Healthy volunteers					
Huguelet et al. (2015) Switzerland	41.6 (10.05)	71%	BPRS	AAI	28	Community clinical sample					
	41.3 (12.01)	61%			18	Healthy volunteers	✓	✓			82%
Wickham et al. (2015) UK *	37.9 (11.55)	70%	PANSS	RQ	176	Community clinical sample					
	37.7 (12.11)	52%			113	Healthy volunteers	✓	✓	✓	✓	91%
MacBeth et al. (2011) UK **	23.3 (7.59)	59%	PANSS	AAI	34	FEP clinical sample					
- van Ijzendoorn & Bakermans-Kranenburg (1996)	-	-			227	Young adults	✓	✓			73%
- Tyrrell & Dozier (1997)	-				42	Chronic mental illness sample					

Non-clinical studies

Berry et al. (2006) UK *	21.0 (nr)	28%	PS LSHS SAS	PAM ¹ RQ	323	Students	✓	✓	77%
Berry et al. (2007a) UK	21.0 (nr)	22%	O-LIFE	PAM	304	Students	✓	✓	82%
MacBeth et al. (2008) UK *	20.2 (2.82)	22%	PS LSHS PDI	RSQ	213	Healthy volunteers	✓		100%
Pickering et al. (2008) UK *	20.9 (5.22)	30%	rLSHS PADS	RQ	503	Students	✓		91%
Tiliopoulous & Goodall (2009) UK	46.9 (18.9)	32%	SPQ	ECR	161	Healthy volunteers	✓	✓	95%
Sheinbaum et al. (2013) Spain, USA	20.6 (4.11)	17%	WSS	RQ	547	Spanish students	✓		
	19.8 (3.93)	24%			1425	American students	✓	✓	91%
Sitko et al. (2014) USA *	-	-	UM-CIDI	AAQ	5877	National community sample	✓		95%

* Denotes studies where composite effect size was calculated for analysis ** includes data from existing studies ¹measure used for analysis

Abbreviations: ARMS = At-risk mental state; FEP = First Episode Psychosis; UHR = Ultra-high risk

Attachment measures: Adult Attachment Interview (AAI: Caplan & Main, 1996); Adult Attachment Questionnaire (AAQ: Hazan & Shaver, 1987); Attachment Style Questionnaire (ASQ: Feeney, Noller & Hanrahan, 1994); Experiences in Close Relationships (ECR: Brennan, Clark & Shaver, 1998); Psychosis Attachment Measure (PAM: Berry, Wearden, Barrowclough, & Liversidge, 2006); Revised Adult Attachment Scale (RAAS: Collins, 1996); Relationship Questionnaire (RQ: Bartholomew & Horowitz, 1991); Relationship Style Questionnaire (RSQ: Griffin & Bartholomew, 1994).

Psychosis measures: Brief Psychiatric Rating Scale (BPRS: Ventura et al., 1993); Community Assessment of Psychic Experience (CAPE: Stefanis et al., 2002); Green et al. Paranoid Thoughts Scale (GPTS: Green et al., 2008); Launay-Slade Hallucination Scale (LSHS: Launay & Slade, 1981); Oxford-Liverpool Inventory of Feelings and Experiences scale (O-LIFE: Mason, Calridge & Jackson, 1995); Persecution And Deservedness Scale (PADS: Melo, Corcoran, Shryane, & Bentall, 2009); Positive and Negative Syndrome Scale (PANSS: Kay, Fiszbein & Opler, 1987); Peters Delusion Inventory (PDI: Peter, Joseph, Day & Garety, 2004); Psychotic Symptom Rating Scales (PSYRATS: Haddock, McCarron, Tarrier & Faragher, 1999); Paranoia Scale (PS: Fenigstein & Vanable, 1992); Launay-Slade Hallucination Scale-Revised version (rLSHS: Morrison, Wells & Nothard, 2000); Scale for the Assessment of Negative Symptoms (SANS: Andreasen, 1982); Scale for the Assessment of Positive Symptoms (SAPS: Andreasen, 1984); Social Anhedonia Scale (SAS: Eckblad, Chapman, Chapman & Mishlowe, 1982); Symptom Checklist (SCL-90R: Derogatis, 1997); Structured Interview for Prodromal Syndromes (SIPS: Miller et al., 2002); Schizotypal Personality Questionnaire (SPQ: Raine, 1991); University of Michigan Composite International Diagnostic Interview (UM-CIDI: Wittchen & Kessler, 1994); Wisconsin Schizotypy Scales (WSS: Kwapil, Barrantes-Vidal, & Silvia, 2008).

Prevalence of insecure attachment

Ten studies reported prevalence rates of insecure attachment style in clinical ($k = 11$) and non-clinical ($k = 6$) samples. The results of the subgroup analyses are presented in Figure 2. Within the psychosis sample, the pooled estimate prevalence of individuals identified as having insecure attachment styles was 76% (95% CI= .65-.84). This was significantly higher ($Q = 29.24$, $df = 1$, $p < .001$) than reported prevalence rates of insecure attachment in non-clinical samples (38%; 95% CI = .31 - .44).

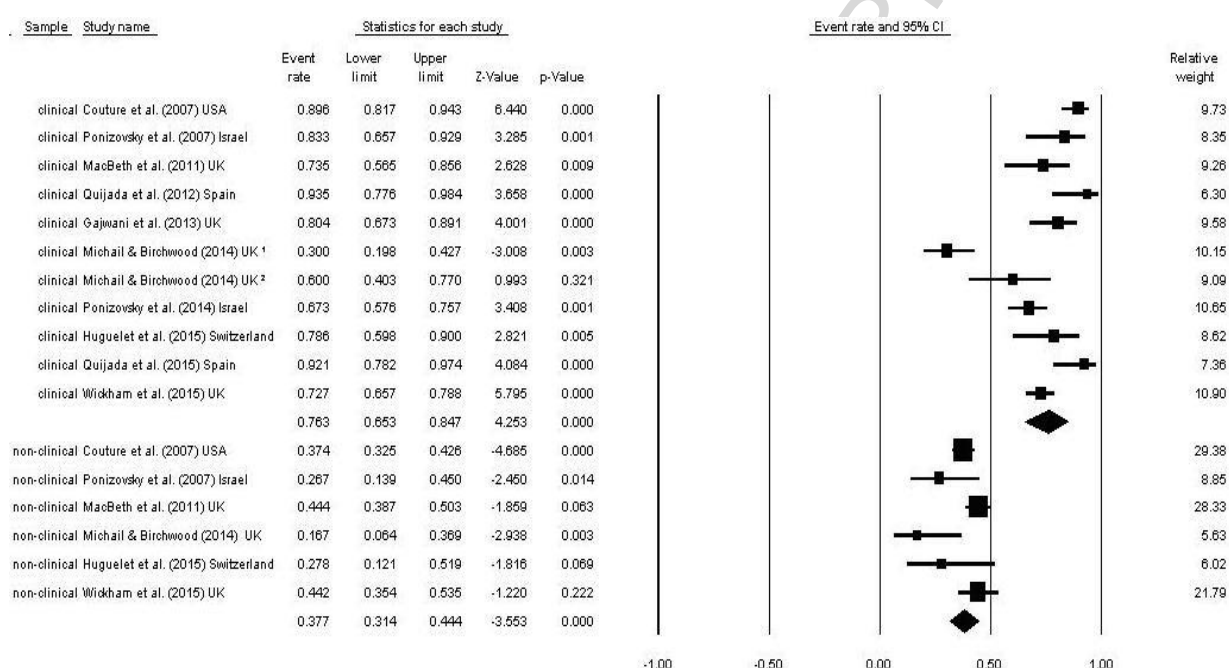


Fig. 2. Prevalence of insecure attachment in clinical and non-clinical sample

Subgroup prevalence rates

Further subgroup analysis was carried out within the psychosis sample to examine the distribution of insecure attachment style (anxious, avoidant, fearful) within this population. Fearful attachment style was found to have the highest prevalence in the studies analysed with a pooled estimate of 38% ($k = 7$, 95% CI= .26 - .50). The second most prevalent was avoidant which accounted for 23% of the sample ($k = 10$, 95% CI= .13 - .37). Anxious attachment was only found to occur in 17% of individuals with psychosis ($k = 10$, 95% CI= .09 - .28).

Heterogeneity in prevalence studies

Heterogeneity between studies was assessed using the Q and I^2 statistics. Conventions suggest I^2 values of 25%, 50% and 75% can be interpreted as low, moderate and high, respectively (Higgins, Thompson, Deeks & Altman, 2003). As anticipated, the overall effect size for insecure attachment within the psychosis population appeared to be heterogeneous ($Q = 72.47, df = 10, p < .001$). Additionally, substantial variability was observed between the included studies ($I^2 = 86.20$) meaning that 86% of the variance in effect sizes was due to between-study variance.

Subsequent subgroup analysis of insecure attachment type within the clinical sample also displayed high variance (i.e., all $I^2 \geq 86.55$), indicating considerable heterogeneity between studies. The non-clinical sample showed evidence of lower heterogeneity ($Q = 12.15, df = 5, p = .03, I^2 = 58.84$) suggesting there was only moderate variability between these study samples.

Relationship between attachment style and symptom severity

The relationship between positive and negative symptom severity and anxious and avoidant attachment dimensions were examined within clinical and non-clinical study samples (see Figs. 3 & 4). As already stated, individuals who have a fearful attachment style present as both highly anxious and avoidant. Far fewer studies have looked at the association between symptoms and this third attachment style, instead examining the relationship with the two underlying dimensions.

Across the continuum, small, significant associations were found between positive symptoms and both anxious (clinical: $k = 11, r = .23, 95\% \text{ CI} = .14 - .33, z = 4.62, p < .001$; non-clinical: $k = 10, r = .28, 95\% \text{ CI} = .21 - .35, z = 7.66, p < .001$) and avoidant (clinical: $k = 11, r = .15, 95\% \text{ CI} = .04 - .25, z = 2.76, p = .006$; non-clinical: $k = 10, r = .19, 95\% \text{ CI} = .13 - .25, z = 5.95, p < .001$) attachment styles.

The picture for negative symptoms was less consistent. While within non-clinical samples negative symptoms were found to have a medium association with avoidant attachment ($k = 5, r = .38, 95\% \text{ CI} = .28 - .48, z = 7.00, p < .001$) and a small relationship with anxious attachment style ($k = 5, r = .25, 95\% \text{ CI} = .12 - .37, z = 3.68, p < .001$), these findings were not replicated amongst clinical samples (anxious attachment: $k = 7, r = .11, 95\% \text{ CI} = -.03 - .25, z = 1.90, p = .057$; avoidant: $k = 7, r = .11, 95\% \text{ CI} = -.03 - .25, z = 1.50, p = .133$).

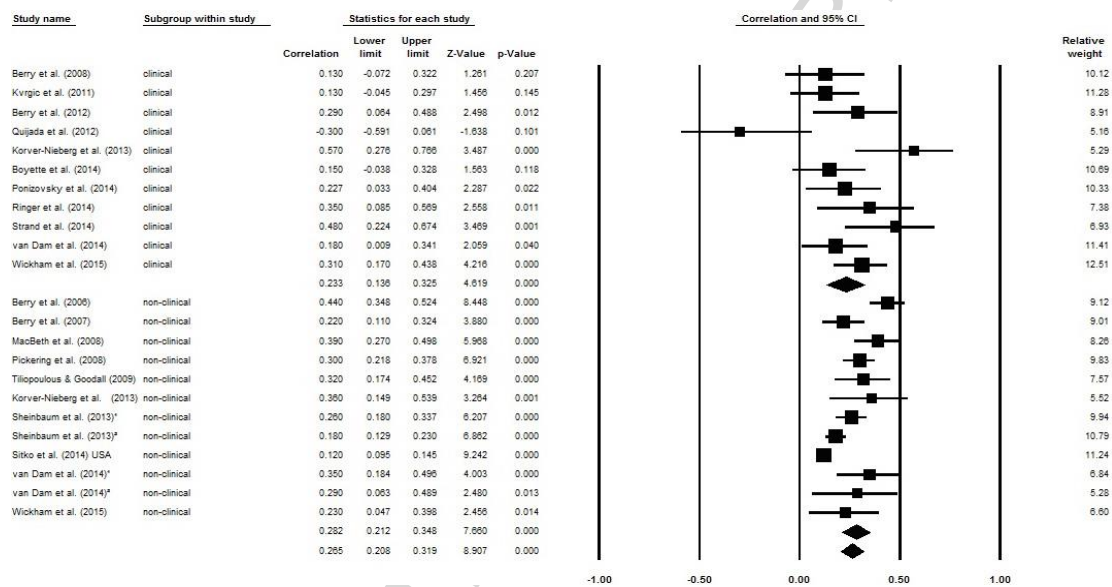


Fig. 3a. Relationship between positive symptoms and anxious attachment style

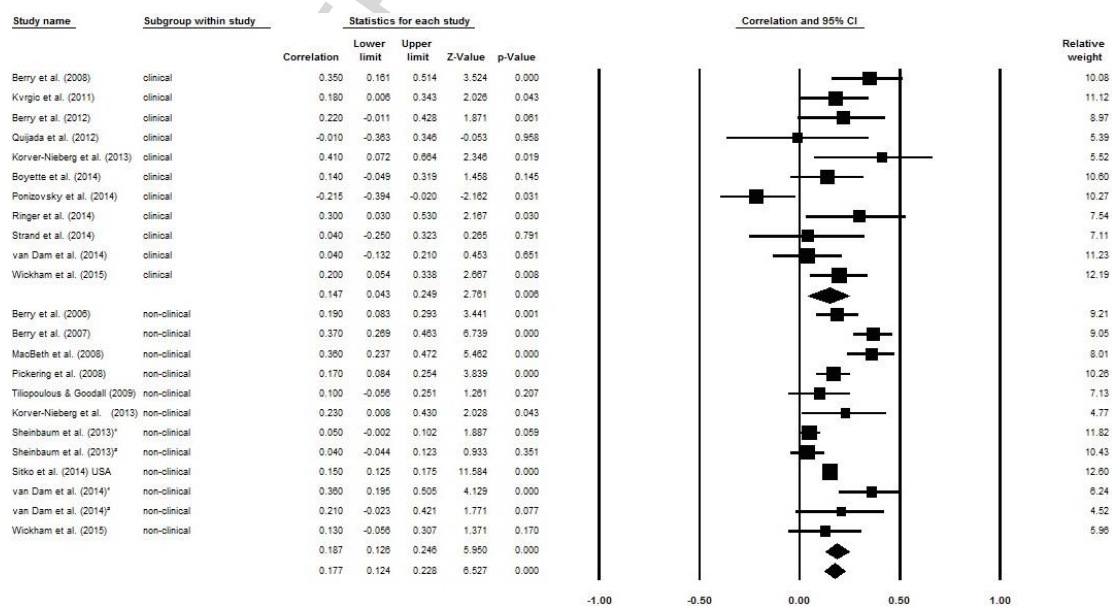


Fig. 3b. Relationship between positive symptoms and avoidant attachment style

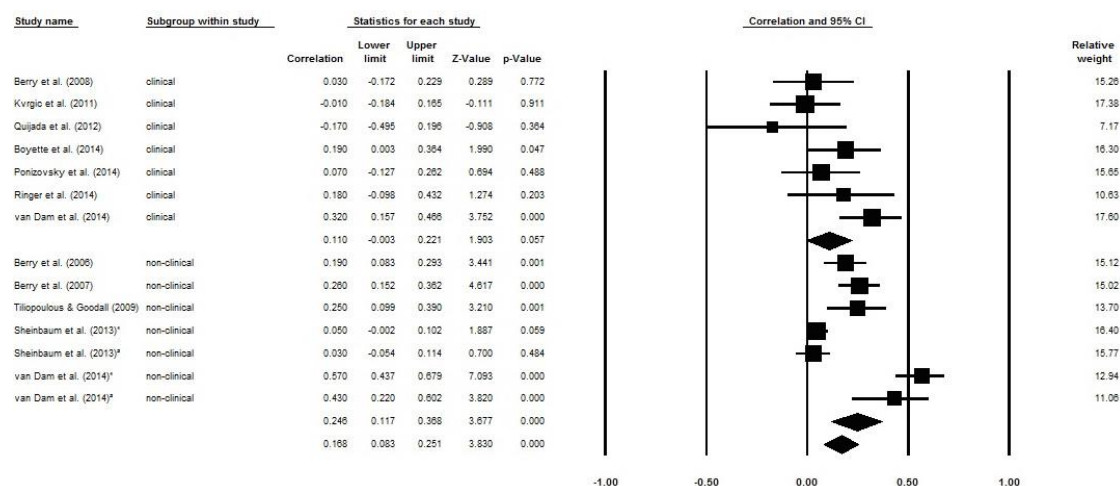


Fig. 4a. Relationship between negative symptoms and anxious attachment style

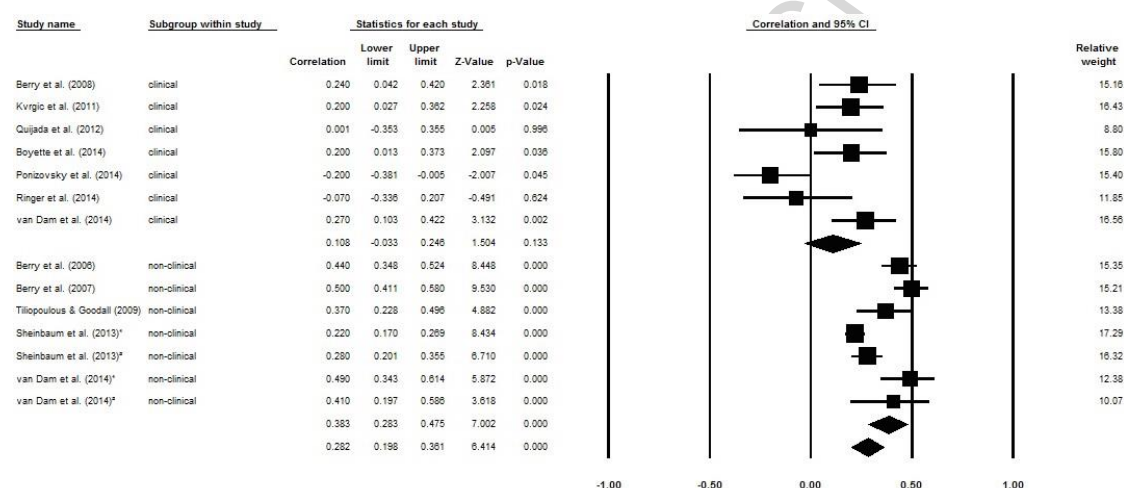


Fig. 4b. Relationship between negative symptoms and avoidant attachment style

Heterogeneity in symptom severity studies

Subsequent subgroup analyses displayed significant heterogeneity for all non-clinical samples (i.e., all $I^2 \geq 80.66$) while the clinical subgroups displayed moderate variance across the analyses (i.e., all $I^2 = 49.82 - 67.54$). This suggests considerable statistical inconsistency in effect across studies.

Publication bias

Egger's test for funnel plot asymmetry (Egger et al., 1997) was applied to whole sample analyses to assess for potential biases from publication and other selection biases. The results showed that Egger's test was not significant for prevalence of insecure attachment style ($p = .07$), anxious attachment style and negative symptoms (p

= .11), and avoidant attachment and positive ($p = .35$) or negative ($p = .87$) symptoms. However, publication bias was indicated in the relationship between anxious attachment style and positive symptoms ($p = .002$). As Egger's test is influenced by high heterogeneity and may be unreliable in meta-analyses made up of a small number of studies, the trim-and-fill method (Duval & Tweedie, 2000) was also applied. The findings indicated no adjustments for insecure attachment style prevalence or attachment style and negative symptom severity. For positive symptoms and anxious attachment style, the trim-and-fill method indicated that two studies were added below the effect size, resulting in a slightly lower effect size (adjusted $r = .25$, 95% CI = .20 - .30). The trim-and-fill method also indicated that three studies were added below the effect size for positive symptoms and avoidant attachment, again resulting in a slightly lower effect size (adjusted $r = .15$, 95% CI = .09 - .20). Therefore, the data may have overestimated the relationship between positive symptoms and attachment style to a small degree.

One study removed analysis

It was hypothesised that two studies may have been exerting undue influence over the meta-analytic results within the clinical subsamples as they were the only two papers to report negative relationships between symptom severity and attachment style (Ponizovsky, Arbitman, Baumgarten-Katz & Grinshpoon, 2014; Quijada, Tizón, Artigue, Kwopil & Barrantes-Vidal, 2012). The results of the one study removed analysis suggested that these studies may be outliers within specific subgroup analyses.

Removal of Quijada et al. (2012) from the clinical subgroup analysis of the relationship between symptom severity and anxious attachment style changed the relationship from non-significant to significant for negative symptoms (adjusted $r = .13$, 95% CI = .02 - .24, $p = .020$, $I^2 = 47.11$) and strengthened the association in positive symptoms (adjusted $r =$

.25, 95% CI = .17 - .33, $p < .001$, $I^2 = 37.04$). This was also found to be the case when Ponizovsky et al. (2014) was removed from the subgroup analysis of the relationship between symptom severity and avoidant attachment style (negative symptoms: adjusted $r = .19$, 95% CI = .10 - .27, $p < .001$, $I^2 = 10.64$; positive symptoms: adjusted $r = .19$, 95% CI = .11 - .27, $p < .001$, $I^2 = 15.55$). Further examination of the quality assessment of both papers did not highlight any methodological or sampling reasons to exclude the papers from analysis and given that they were not consistent outliers across all subgroup analysis it may be that these papers represent genuine heterogeneity within this field of research and were therefore kept within the analysis (Ryan, 2013), however, it is worth noting that these studies were both drawn from Mediterranean cultures which may influence the presentation of attachment style (van Ijzendoorn & Kroonenberg, 1988).

Discussion

The current meta-analysis aimed to build on existing reviews by examining the prevalence of attachment styles and their association with the symptoms of psychosis in clinical and non-clinical samples. The meta-analysis showed that the prevalence of insecure attachment style is significantly higher in individuals with psychosis, almost 80%, compared to just under 40% in the non-clinical group. This finding makes sense given the high rates of attachment disrupting events that individuals with psychosis have been found to experience (Bentall et al., 2014; Varese et al., 2012).

The majority of people with psychosis were shown to have a fearful attachment style, which is striking given that the majority of studies included in the analysis did not assess fearful attachment, so the prevalence rate reported in the current analysis could be a considerable under-estimation. This finding differs from previous reviews, which have suggested avoidant attachment style is most prevalent in psychosis (Berry et al.,

2007b; Korver-Nieberg et al., 2014; Gumley, et al., 2014). This may be due several studies assesses the underlying dimensions of attachment, as in the PAM (Berry et al., 2006), rather than categorical relating styles, however, the inclusion of more samples of at-risk groups may also explain this discrepancy. Since the most recent review, there has been an increase in the number of studies looking at attachment in at-risk groups, with three included in the current review. While fearful attachment was the most commonly reported style in five of the eight studies included in the analysis of attachment style prevalence, the rates of reporting were highest in the at-risk study samples. Attachment styles appears to be less stable in high-risk populations (van Ijzendoorn & Bakermans-Kranenburg, 1997) meaning that individuals at-risk of developing psychosis may be more likely to oscillate between anxious and avoidant relating styles, which may account for the increased prevalence of fearful attachment style within the sample.

Fearful attachment and symptoms of psychosis

Fearful attachment style is understood to arise from early experiences of unresolved separation, loss and violence at home (van Ijzendoorn, Schuengel & Bakermans-Kranenburg, 1999) and is predictive of general psychopathology, social and cognitive difficulties (Green & Goldwyn, 2002; Kay & Green, 2013). Moreover, fearful attachment has been associated with increased dissociative states (van Ijzendoorn et al., 1999), low self-esteem (Bentall & Fernyhough, 2008) and a greater number of maladaptive schematic views of the self and others in individuals with psychosis (Mason, Platts & Tyson, 2005) and high-risk clinical groups (Addington & Tran, 2009). It is understood that increased dissociation in response to childhood sexual abuse and neglect may mediate the relationship between trauma and hallucinations (Perona-Garcelán et al., 2010; Varese, Barkus, & Bentall, 2012) through

the adoption of a dissociative coping style as a way to manage early trauma experienced (Kilcommons & Morrison, 2005). The experience of dissociation can then limit the infant's ability to develop a coherent sense of self (Bowlby, 1980) which is exacerbated when the infant is confronted with subsequent traumatic experiences, such as loss, abuse or neglect, leading to the development of multiple working models of the self and others, which can often be conflicting (Liotti, 1992). Limited experience of available attachment figures as well as trauma in childhood are understood to increase one's vulnerability to negative views of the self and others and increase the chance of psychotic-like experiences (Fisher, Appiah-Kusi & Grant, 2012). Anomalous attachment experiences can also lead individuals to attempt to gain or escape the attention of their significant care giver through both emotional hyperactivity (anxious) and emotionally dismissive (avoidant) strategies (Gajwani et al., 2013). It is likely that individuals with psychosis who have a fearful attachment style may have learnt to rely on dissociative (avoidant) coping styles, resulting in disorganised thinking and emotional hyperactivity, as well as sensitivity to social cues (anxious), which could result in positive symptoms.

Future research, including a greater number of longitudinal and at-risk samples, examining the role of fearful attachment in psychosis is needed to fully understand the impact that it has on the development and maintenance of positive symptoms in relation to other mediating cognitive factors. Individuals with a fearful attachment style may experience more affective dysregulation, negative views of the self and anxiety about rejection from others in the prodromal stages of psychosis (Quijada et al., 2015). However, over time they may develop more established attachment strategies which are focused around avoidance and symptom minimisation (Berry et al., 2012) as shown in previous reviews where avoidant attachment style has appeared most prevalent.

Attachment insecurity across the psychosis continuum

There was a small but significant relationship between increased symptom severity and insecure attachment. As with previous reviews, this relationship was more evident in non-clinical samples (Korver-Nieberg et al., 2014). These results appear to be in line with the continuum model of psychosis, which suggest that increased subclinical positive and negative symptoms are associated with the same social and environmental risk factors known to contribute to psychosis, including stressful and traumatic experiences such as childhood adversity, discrimination and living in an urban environment (van Os, Linscott, Myin-Germeys, Delespaul & Krabbendam, 2009). Individuals with sub-clinical psychotic-like experiences have also been found to have deficits in mentalizing (Versmissen et al., 2008) and social cognition, such as jumping to conclusions (van Os & Reininghaus, 2016), which influences the individual's sensitivity to social and environmental cues. Increased adverse social experiences and problematic cognitive biases developed as a result of early interpersonal experiences are both known to contribute to the development of insecure attachment meaning that it would be expected that there would be an association across in both clinical and non-clinical groups between increased positive and negative symptom reporting and both anxious and avoidant attachment styles.

Attachment insecurity and positive symptoms of psychosis

The current analysis found the greatest relationship between positive symptoms and anxious attachment style, which is in contrast to previous reviews that have more commonly reported a relationship between avoidant attachment style and increased symptom severity within psychosis populations (Berry et al., 2007b; Korver-Nieberg et al., 2014). However, anxious attachment style has been linked to low self-esteem and a negative self-image in psychosis (Ringer, Buchanan, Olesek & Lysaker, 2014) and there are high rates of comorbid social anxiety within this population (Michail & Birchwood,

2014). Parental working models of attachment and are also understood to influence an individual's attachment style in adulthood and high levels of anxious attachment style, associated with emotional over involvement and increased critical comments from carers, have been found in the carers of people with psychosis (Alvarez-Jimenez et al., 2010). Increased experiences of criticism at home may lead the individual to develop a greater number of negative cognitive biases (Berry et al., 2007b) known to contribute to the positive symptoms of psychosis through the misappraisal of anomalous experiences (Garety, Kuipers, Fowler, Freeman & Bebbington, 2001). Additionally, positive symptoms could develop as a result of increased anxiety and poorer affect regulation in psychosis (Gumley & Schwannauer, 2006) as research in at risk groups has found high rates of interpersonal sensitivity and stress reactivity can predict positive symptoms, such as paranoia, in non-clinical and at-risk samples (Lataster, Valmaggia, Lardinois, van Os & Myin-Germeys, 2013; Masillo et al., 2012). Given the significant role that anxiety appears to have in development and maintenance of positive symptoms, particular attention should be paid to affect dysregulation and negative cognitive biases, such as shame and fear of stigma, when developing new interventions for psychosis (Michail & Birchwood, 2014).

A small relationship was also found between attachment avoidance and positive symptoms across clinical and non-clinical samples. This finding supports the hypothesis that there is a link between paranoia and avoidance, understood to be caused by distrust of others and increased social isolation (Freeman, Garety, Kuipers, Fowler & Bebbington, 2002). Moreover, hallucinatory experiences are understood to be underpinned by externalising cognitive biases (Brookwell, Bentall & Varese, 2013) which are characteristic of an avoidant relating style where the infant "turns away"

from the care-giver when distressed and as a result develops externalising affect regulation and behaviours in later life (Harder, 2014).

Attachment insecurity and negative symptoms of psychosis

The relationship between negative symptoms and attachment insecurity was found to be less consistent. This finding is in contrast to previous reviews which have indicated a link between avoidant attachment style and negative symptoms in clinical populations (Korver-Nieberg et al., 2013; Gumley et al., 2014). While there was a significant association between negative symptoms and insecure attachment in the non-clinical analysis this was not the case in the clinical analysis. This may be in part due to the fact that fewer studies examined the relationship between attachment style and negative symptoms and the influence of outliers within the analysis. However, despite the relationship becoming significant once outliers were removed, the relationship remained smaller than the association between positive symptom severity, anxious, and avoidant attachment.

The discrepancy in findings between the clinical and non-clinical groups may have been influenced by the increased use of schizotypy measures within non-clinical studies. Whilst high scores on measures of negative schizotypy are indicative of sub-clinical negative psychotic-like experiences, the constructs that are assessed (e.g. social anhedonia) could also be conceptualised as discomfort with, and decreased experiences of, intimacy which overlap significantly with the construct of avoidant attachment (Kwapil, Barrantes-Vidal & Silvia, 2008). However, avoidant coping styles have also been associated with increased “sealing over” or minimisation of symptoms and has been associated with poorer clinical outcomes (Gumley et al., 2014; Korver-Nieberg et al., 2014; Tait, Birchwood & Trower, 2003). Therefore, the group differences highlighted may be due to lower rates of symptom reporting by clinical participants with avoidant

coping styles or an overall reduction in help-seeking and engagement in services by such individuals, meaning that they are not represented by clinical research samples.

Limitations of the review

Heterogeneity of effect size and publication bias

The substantial levels of statistical heterogeneity displayed between studies means that any conclusions drawn from the analysis should be interpreted with caution and limits the generalisability of the findings of the review (Higgins, Thompson & Deeks, 2003). However, rates of insecure attachment in both the clinical and non-clinical samples are comparable to those reported in an extensive review of attachment assessment and categorisation suggesting that, despite small sample sizes and high variance in effect size, the results are consistent with existing research in this field (Bakermans-Kranenburg & van IJzendoorn, 2009). Analysis of publication bias indicated that the relationship between positive symptoms and attachment style may have been over-estimated in the current analyses, however, trim-and-fill analysis suggested that the effect size was only marginally reduced and the relationship remained significant.

Study methodologies and measurement

As in previous reviews, a key limitation of the current review is that the studies included were all cross-sectional and therefore no conclusions about the causal relationship between psychosis and attachment can be made (Berry et al., 2007b; Korver-Nieber et al., 2014). To fully understand this relationship, including whether attachment style is predictive of the symptoms of psychosis or whether attachment style changes as a result of psychosis, prospective longitudinal studies are essential. However, an increasing number of studies have included at-risk populations (Gajwani,

Patterson, & Birchwood, 2013, Quijada et al., 2012; Quijada et al., 2015) which goes some way to address this methodological weakness.

Differences across clinical and non-clinical studies in the measures used to assess symptom severity also limits the generalisability of the findings. Whereas the majority of clinical studies used observer rated measures, the non-clinical and case-control studies were more likely to use self-report measures. Within clinical samples, self-report measures are associated with reporting fewer psychiatric symptoms than when using observer rated measures, this was found to be especially prevalent amongst individuals with psychosis who had avoidant attachment styles (Gumley et al., 2014). There is also some debate over the validity of the PAM as a self reported assessment of attachment in psychosis, in particular in relation to attachment avoidance (Olbert et al., 2016). The use of self-report measures within case-control studies included in the analysis may have influenced the level of association found between symptom severity and attachment styles and should be taken into consideration when designing future attachment research with individuals with psychosis. Non-clinical studies also tended to use more measures of schizotypy symptoms than global psychosis symptom measures. There has been debate about whether these measures are assessing sub-clinical symptom experiences or instead assess trait characteristics. However, a recent review argued that existing measures of schizotypy are robust at assessing both sub-clinical psychotic like experiences and characterological traits (Mason, 2015) suggesting that these measurements are appropriate for assessing the symptoms of psychosis across the continuum.

Clinical implications: the role of attachment in recovery

Previous reviews have outlined the impact that insecure attachment has on engagement with services and recovery style, it is also associated with increased

hospitalisation and lengths of stay on inpatient wards (Korver-Nieberg et al., 2014; Gumley et al., 2014). The current analysis found evidence that there are high rates of individuals with psychosis who have a fearful attachment style, particularly within at-risk groups. This finding is important when considering therapeutic engagement and the subsequent impact that will have on recovery. Individuals with fearful attachment are at higher risk of depression and social anxiety and therapeutic interventions may need to focus on affect regulation more broadly, as well as in relation to the positive symptoms of psychosis (Gajwani et al., 2013). Individuals with fearful attachment styles are also likely to have increased difficulties with interpersonal relating and emotion regulation in adulthood (Young, Klosko & Weishaar, 2003) as a result of early care experiences. This means they are at increased risk of experiencing services as simultaneously intrusive and rejecting and may struggle with continued contact with services or to disengage at crucial points in their treatment (Bartholomew & Horowitz, 1991).

However, it is also important to remember that attachment can be a protective factor as much as it is a risk factor and a secure attachment may help to defend against symptoms and improve recovery outcomes through increased resilience (Harder, 2014). There is also evidence that attachment style can change over time (Pinquart, Feußner, & Ahnert, 2013) and psychosis itself may be an attachment disrupting event as it has been conceptualised as a traumatic event which significantly changes interpersonal relationships (Morrison, Bowe, Larkin & Nothard, 1999; Rooke & Birchwood, 1998). Therefore, engagement with services may give individuals with an insecure attachment style the opportunity to develop alternative coping strategies and interpersonal relating styles which may in turn improve recovery outcomes. Finally, attachment is only one mechanism in a complex and heterogeneous disorder and it is

important to think about within the context of multiple social and environmental factors which contribute to the development and maintenance of symptoms (Bentall et al., 2014).

Conclusion

The current review is the first to critically and systematically evaluate the relationship between attachment style and experience of psychosis within clinical and non-clinical samples. The paper built on previous reviews by including studies that reported on first episode psychosis and ultra-high risk groups (Gumley et al., 2014) as well as those with more enduring symptoms. Significantly higher rates of insecure attachment were found in psychosis populations, with a fearful attachment style being the most prevalent. Insecure attachment style was also associated with positive and negative symptom severity in both clinical and non-clinical samples. Given the high variability in the findings presented, any conclusions drawn should be tentative given that this is a fairly new area of research within psychosis. Nonetheless, there are important potential clinical implications, in particular in relation to how attachment style impacts upon affect regulation and interpersonal relating which in turn affects engagement with services and subsequent recovery from psychosis. Future research in attachment should attempt to address the issue of how it relates to the development of psychosis and the interaction between attachment style and other social-environmental risk and protective factors.

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Highlights

- Prevalence of insecure attachment is significantly higher in psychosis sample
- Within psychosis samples, a fearful attachment style was most prevalent
- There is a small relationship between insecure attachment and positive symptoms
- Insecure attachment only linked to negative symptoms within non-clinical samples
- Longitudinal studies may increase our understanding of attachment in psychosis